



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/810,962	03/16/2001	Atsuo Omaru	09792909-4809	7248

26263 7590 10/19/2004

SONNENSCHN NATH & ROSENTHAL LLP  
P.O. BOX 061080  
WACKER DRIVE STATION, SEARS TOWER  
CHICAGO, IL 60606-1080

EXAMINER

DOVE, TRACY MAE

ART UNIT	PAPER NUMBER
----------	--------------

1745

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/810,962

Applicant(s)

OMARU ET AL.

Examiner

Tracy Dove

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 20 July 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-5,8,10 and 15-46 is/are pending in the application.
- 4a) Of the above claim(s) 15-46 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5,8 and 10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This Office Action is in response to the communication filed on 7/20/04. Applicant's arguments have been considered, but are not persuasive. Claims 1-5, 8, 10 and 15-46 are pending. Claims 6, 7, 9 and 11-14 are canceled. Claims 15-46 are withdrawn. This Action is made FINAL, as necessitated by amendment.

#### ***Election/Restrictions***

Applicant's election of Group I in Paper No. 6 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

#### ***Specification***

The amendment filed 7/20/04 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: on page 11, last paragraph, the specification has been amended to recite "the ratio of the weight change of the graphite material", which is not supported by the original disclosure. The original disclosure stated "weight reduction" and did not specify the weight of "the graphite material" was used to obtain the reform rate. On page 11, last paragraph, the specification has be amended to recite "the external coating material is the portion of the particles undergoing the specific surface area change", which is not supported by the specification as filed.

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Claims Analysis***

The claimed invention recites the graphite in the negative electrode has a “rhombohedral structure”. The specification discloses that natural graphite has a “rhombohedral structure” (page 21) and that natural graphite having a “rhombohedral structure” may be used as a starting material (page 42). Thus, in view of the teaching of the present specification, natural graphite contains a “rhombohedral structure”.

### ***Claim Objections***

Claims 2 and 5 are objected to because of the following informalities: each of claims 2 and 5 recite “after pressing is 2.5 times and below”, which should state “after pressing is 2.5 times or below”. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 recites a reform rate within the range of 1 to 38 which is indefinite because it is unclear how the reform rate is obtained. The specification does not provide adequate disclosure regarding a reform rate (see page 11). The specification recites the reform rate is defined as the ratio of the weight change of the graphite material, as calculated by the DTG. However, the specification does not provide adequate disclosure regarding calculating the ratio of the weight

change from the DTG curve. The DTG curve is a thermal analysis of the carbon material and it is unclear how a ratio of the weight change of the carbon material is obtained for the DTG curve.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 8 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Hayashi et al., JP 10-334915.

Hayashi teaches a rechargeable battery having an electrode comprising graphite particles. A dynamic energy process is applied to a graphite material so that the apparent density ratio between before and after the process becomes 1.1 or above. The apparent density ratio between before and after the process equals the tap density after the process/tap density before the process, and this is to become the index of sphericity. See abstract.

The intensity ratio R of a Raman spectrum is preferably 0.4 or less. In the Raman spectrum analysis, the intensity IA of peak PA near  $1580\text{ cm}^{-1}$  and the intensity IB of peak PB near  $1360\text{ cm}^{-1}$  were measured (0035). Therefore,  $R=IB/IA=H_{sd}/H_{sg}$  and  $H_{sg}/H_{sd}=1/R=G_s$ . Since R is 0.4 or less, Hayashi teaches  $G_s$  is 2.5 or more.

The tap density ratio before and after processing is 1.7 or greater, more preferably 1.1 or greater. It is desirable to have a tap density after processing of 0.5-2 g/cc (see page 4, paragraph 0023-0024). The tap density of the graphite material is preferably in the range of 0.7-1.2 g/cc (see page 7, paragraph 0042). The true density of the graphite material is 2.25 g/cc or more

Art Unit: 1745

(claim 2). Thus a packing characteristic index (tap density/true density) of Hayashi may be 0.53 ( $1.2/2.25 = \text{tap density/true density}$ ).

The specific surface area of the graphite particles after processing (pulverizing) is below  $25 \text{ m}^2/\text{g}$  and more than  $0.5 \text{ m}^2/\text{g}$ , preferably  $2\text{-}10 \text{ m}^2/\text{g}$  (0035). Table 4 shows different graphite material properties before and after a dynamic energy process/treatment. The SA in Table 4 represents surface area with the surface area of the graphite being  $19.1 \text{ m}^2/\text{g}$  before treatment and  $8.9 \text{ m}^2/\text{g}$  after treatment (Example 13). The surface area after treatment is 2.1 times that before treatment. The energy process is specifically pulverization. Hayashi teaches a surface area of the graphite being  $4.5 \text{ m}^2/\text{g}$ ,  $4.8 \text{ m}^2/\text{g}$ ,  $8.7 \text{ m}^2/\text{g}$  or  $19.1 \text{ m}^2/\text{g}$  before treatment (Table 4) and preferably  $2\text{-}10 \text{ m}^2/\text{g}$  after treatment (0035). Hayashi teaches an electrode having a graphite material with a (d002) distance between layers of  $0.34\text{nm}$  or less (claim 2).

Hayashi teaches natural graphite of high orientation/high crystallinity is used (0013-0014). High crystallinity natural graphite is known to have a rhombohedral structure (diamond structure). Hayashi teaches the natural graphite may be subjected to a surface grinding process (0029). Natural graphite has a rhombohedral structure (as stated in the present specification, see above).

Regarding claim 2, Hayashi does not explicitly state the graphite material has at least two peaks on a differential thermogravimetric curve. However, the graphite material of Hayashi inherently has at least two peaks on a differential thermogravimetric curve because the graphite material of Hayashi has a Raman spectrum having two distinct signal peaks. The two distinct signal peaks on the Raman spectrum indicate the graphite material contains two distinct carbon

materials. A graphite material having two distinct carbon materials would inherently provide at least two peaks on a differential thermogravimetric curve.

Thus the claims are anticipated.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al., US 6,482,547.

Yoon teaches lithium secondary battery having a negative active material including a crystalline carbon core (graphite) and an amorphous carbon shell. The negative active material has two exothermic peaks of the differential thermal analysis at 1000°C or less (abstract). Figure 4 depicts the differential thermal analysis of the negative active material. The specific surface area of the negative active material is preferably 0.5-6 m<sup>2</sup>/g (col. 4, lines 21-22). The crystalline carbon of the negative active material has a plane distance of d002 of 3.35-3.4 Å of X-ray diffraction plane distance of the (002) plane and the amorphous carbon has a plane distance of d002 of 3.4-3.8 Å of X-ray diffraction plane distance of the (002) plane (col. 5, lines 60-65). The negative active material has optimized advantages due to the crystalline graphite and the amorphous carbon. If a differential thermal analysis is performed on the crystalline graphite, a single peak occurs at 800°C or more, while a single exothermic peak occurs at 700°C or less for the amorphous carbon (col. 6, lines 18-27). The negative active material has the crystalline

graphite and the amorphous carbon having a turbostratic structure. The crystalline carbon has an intensity ratio  $I(1360)/I(1580)$  of a Raman Spectroscopy of less than 0.3 (col. 7, lines 7-19). The lithium battery has a positive electrode, negative electrode and a nonaqueous electrolyte (col. 3, lines 9-19 and col. 7, lines 27-col. 8, lines 13).

Yoon does not explicitly state the carbonaceous active material has a rhombohedral structure.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Yoon teaches the crystalline carbon may have various structures. The crystalline carbon (graphite) may be non-uniform, disk-shaped, flake, spherical or fibrous carbon particles, or two or more of the graphite particles may be mixed together (col. 5, lines 4-13). One of skill would have found a rhombohedral structure for the graphite active material obvious in view of the teachings of Yoon. Specifically, Yoon teaches the crystalline carbon may have various structures.

Yoon does not explicitly state the specific surface area of the graphite after pressing is 2.5 times or below that of the graphite prior to pressing. However, this is considered a product-by-process limitation because only the specific surface area of the graphite contained in the negative electrode of the produced battery limits the product of the claimed invention. The courts have ruled that product-by-process limitations, in the absence of unexpected results, are obvious. See MPEP 2113.

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Yoon teaches the specific surface area of the negative active material is preferably  $0.5\text{--}6\text{ m}^2/\text{g}$ . If the specific surface area exceeds  $6\text{ m}^2/\text{g}$ ,



an unwanted side reaction may occur. On the contrary, if the specific surface area is less than  $0.5 \text{ m}^2/\text{g}$ , the area where the electrolyte is contacted is small and it is difficult to perform a charge-discharge reaction (4:15-28). Note that "2.5 times or below" encompasses zero. So the specific surface area of the graphite after pressing may be the same as that of the graphite prior to pressing.

### ***Response to Arguments***

Applicant's arguments filed 7/20/04 have been fully considered but they are not persuasive.

Applicant does not provide any specific arguments why Hayashi does not anticipate the claimed invention. Therefore, there is nothing for the Examiner to rebut.

The 35 U.S.C. 102(e) rejection in view of Kitagawa (US6,403,259) has been withdrawn.

The 35 U.S.C. 102(e) rejection in view of Ryu (US2002/0006551) has been withdrawn.

Applicant's arguments regarding the anticipation rejection in view of Yoon (US6,482,547) are moot. The 35 U.S.C. 102(e) rejection in view of Yoon has been withdrawn. However, claims 1, 2 and 8 are rejected as obvious in view of Yoon.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ryu US 2002/006551 teaches a carbonaceous active material for a lithium ion secondary battery. Conducting a differential thermal analysis on the carbonaceous active material result in the displaying of at least two exothermic peaks (abstract). It is preferable that the two or more exothermic peaks occur at between  $500\text{-}1000^\circ\text{C}$ , and a difference between the exothermic peaks

is less than 200°C (paragraph 0012). The carbonaceous material may be a surface modified natural or artificial graphite (paragraph 0013). Therefore, a carbon material having two distinct carbon material provides at least two peaks on a differential thermogravimetric curve.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Tracy Dove', with a stylized, cursive script.

Tracy Dove  
Patent Examiner  
Technology Center 1700  
Art Unit 1745

10/15/04